REMARKS

Claims 2-12 and 14-28, 31, 33-38, 41-54, 57-60, 62-98, 101-118, and 120-133 remain in the case. Claims 29, 30, 32, 39, 40, 55, 56, 61, 99, 100, 119, 134, and 135 have been cancelled without prejudice or disclaimer in many cases because of duplicate coverage. In addition, a number of claimed dependencies have been updated to reflect cancellation of some of the claims.

By the above amendment the claims have been amended to specify that in the various claimed embodiments of the invention, the nitrogen compound being halogenated is 5,5-dimethylhydantoin, that the halogenation is bromination, and that the brominated nitrogen compound formed is 1,3-dibromo-5,5-dimethylhydantoin.

The only rejection in the case is the rejection of Claims 2-12 and 14-135 under 35 USC 103(a) on Rogers (2,392,505), Rogers (2,398,598), Paterson (2,779,764), Paterson (3,147,259), Wolf et al. (2,920,997), Waugh et al (3,121,715), Cole (4,621,096), Girard et al (4,560,766), Girard et al (4,654,424), Puzig (4,677,130), Lee et al (4,745,189), Bhattacharya (WO 97-43264), and Jolles (General Methods of Bromination", Bromine and its Compounds, 1966, Ernest Benn, London, page 365), each taken alone or in combination with each other. In view of the above amendment, this rejection is deemed inapplicable.

In the Action, Page 8, it is acknowledged that the instant claims differ from all of the cited art in that the instant claims require the reactants/starting materials be added concurrently, or substantially concurrently, into a reaction zone. Thus it is undisputed that the subject matter of the instant claims clearly distinguishes the instant claims over the prior art.

Also on Page 8 of the Action, the basis for the Rejection is the decision of In re Tatincloux et al., 43 CCPA 722; 228 F.2d 238; 108 U.S.P.Q. 125.

However, as pointed out In re Tatincloux et al., while as a general rule no invention is involved in a broad concept of performing simultaneously operations which have previously been performed in sequence, "[a]n exception may be made where a new and unexpected result is obtained by performing the operations simultaneously." Applicants have shown that indeed unexpected beneficial results are obtained when carrying out the presently claimed invention in a proper manner. In particular, the specification has shown that 1,3-dibromo-5,5-dimethylhydantoin produced by the claimed processes has a substantially larger average particle size than prior art 1,3-dibromo-5,5-dimethylhydantoin, including commercially-produced 1,3-dibromo-5,5-dimethylhydantoin. In fact, the Examiner's own references Girard et al., 4,560,766 at Column 1, lines 56 to Column 2, line 10 and Girard et al., 4,654,424 at Column1, line 60 to Column 2, line 14 teach that 1,3-dibromo-5,5-dimethylhydantoin and its mono and dichloro analogs are finely divided powders:

> However, such halogenated derivatives of dimethylhydantoin are fine, dusty powders which are difficult to compact into solid forms of high integrity or to granulate.

The larger sized particulate 1,3-dibromo-5,5-dimethylhydantoin produced pursuant to the instant invention significantly enhances its utility in that, as pointed out on Page 30 of Applicants' specification, such products are far easier to handle because of their much lower dusting tendencies, and such products have flow properties through pipes and conduits and hoppers that are far superior to the finely-divided 1,3-dibromo-5,5-dimethylhydantoin products of the prior art. Furthermore, as also noted on Page 30, the larger sized particulate 1,3-dibromo-5,5-dimethylhydantoin produced pursuant to this invention can be pressure compacted into shape-retentive tablets without use of a binder and without breakage occurring whereas samples of commercially-available 1,3-dibromo-5,5-dimethylhydantoin could not be converted into tablets in the same manner without breakage occurring. Moreover, as shown by Example 12 and the data in Table 8, the presently claimed processes enabled synthesis of 1,3-dibromo-5,5-dimethylhydantoin having a lower Yellowness Index than samples obtained from commercial sources.

Consequently, unexpected beneficial results have been shown to result from the claimed subject matter. Accordingly, the rejection is deemed inapplicable on the basis of the reasoning set forth In re Tatincloux et al., *supra*. The mere fact that other processes are known for making 1,3-dibromo-5,5-dimethylhydantoin, does not change the fact that there is no suggestion in any of the references of any

possibility of increasing the particle size of the product by use of any synthesis process. Thus one skilled in the art is given no motivation to make any attempt to provide a process that can produce larger sized product with all of its attendant advantages. Rather, the expectation, if any, would be that no synthesis process would be capable of producing a 1,3-dibromo-5,5-dimethylhydantoin product having the present advantageous properties.

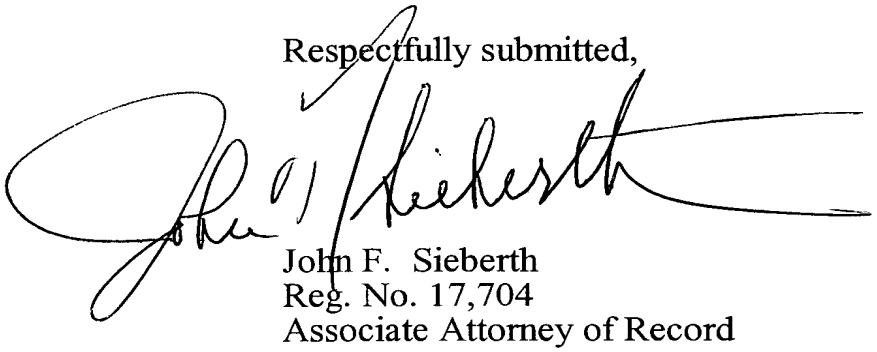
Unexpected beneficial results having been shown to flow from the practice of the presently claimed subject matter, this case clearly falls under the exception noted In re Tatincloux et al. Therefore it is believed that the case is now in condition for immediate allowance, and notice to this effect would be appreciated.

The attached pages headed "Marked-up Pages Showing Changes Made" are provided for the Examiner's convenience.

If any matters remain in requiring further consideration, the Examiner is respectfully requested to telephone the undersigned so that such matters can be discussed, and if possible, promptly resolved.

Please continue to address all correspondence in this Application to Mr. Philip M. Pippenger at the address of record.

Respectfully submitted,



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CERTIFICATE OF MAILING

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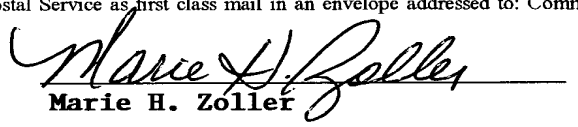

Marie H. Zoller

VERSION WITH MARKINGS TO SHOW CHANGES MADE

132. (Amended) A process for the production of 1,3-dibromo-5,5-dimethylhydantoin, [the N-halogenation of a compound having in the molecule at least one halogenatable amido or imido functional group,] which process comprises concurrently, or substantially concurrently, feeding into a reaction zone:

A) separate feeds of (i) an aqueous solution or slurry formed from an inorganic base and 5,5-dimethylhydantoin, [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom,] and (ii) a brominating agent; [and/or a chlorinating agent;] or

B) at least three separate feeds, one of which is a brominating agent, [and/or a chlorinating agent,] and at least two other feeds, at least one of which is selected from (a) and (b); and at least one of which is selected from (c) and (d), wherein

(a) is an aqueous solution or slurry formed from an inorganic base,

(b) is an aqueous solution or slurry formed from an inorganic base and 5,5-dimethylhydantoin, [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom,]

(c) is 5,5-dimethylhydantoin, [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom,] and

(d) is an aqueous solution or slurry formed from 5,5-dimethylhydantoin; [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom;]

in proportions such that 1,3-dibromo-5,5-dimethylhydantoin is [at least one said amido or imido nitrogen atom becomes substituted by a bromine or chlorine atom, thereby] continuously or substantially continuously formed and [forming product which] precipitates in the liquid phase of an aqueous reaction mixture during all or substantially all of the time said concurrent feeding is occurring, and such that the pH of said liquid phase is continuously or substantially continuously maintained in the range of about 5.5 to about 8.5 during all or substantially all of the time said concurrent feeding is occurring.

2. (Twice Amended) A process of Claim 132 wherein said pH is in the range of about 6.5 to about 8.5, and wherein the brominating agent [and/or chlorinating agent] used is bromine.[, bromine chloride, or bromine and chlorine.]

3. (Twice Amended) A process of Claim 132 wherein at least said 5,5-dimethylhydantoin [compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] and said inorganic base are fed in the form of a single preformed aqueous solution or slurry.

4. (Twice Amended) A process of Claim 132 wherein at least said 5,5-dimethylhydantoin [compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] is fed in the form of a separate preformed aqueous solution or slurry, and wherein at least said inorganic base is fed in the form of a separate preformed aqueous solution or slurry.

6. (Twice Amended) A process of Claim 132 wherein said feeding is initially to a mixing device which produces an effluent stream formed from:

A) said 5,5-dimethylhydantoin [compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] and said inorganic base; or

B) (i) said 5,5-dimethylhydantoin [compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] and water, (ii) said inorganic base and water, or (iii) said brominating agent [and/or chlorinating agent] and water; or

C) said 5,5-dimethylhydantoin [compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom], said inorganic base, and water;

and wherein the effluent stream is fed into a reaction vessel containing a larger volume of the aqueous reaction mixture; wherein said stream is subjected to dilution in the aqueous reaction mixture before the temperature of said effluent stream exceeds about 90°C; and wherein the temperature of the aqueous reaction mixture is maintained in the range of about 0 to about 90°C during all or substantially all of the time said feeding is occurring.

10. (Twice Amended) A process of Claim 132 [wherein said compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom is a 5,5-dialkylhydantoin in which each alkyl group has, independently, up to about three carbon atoms;] wherein said inorganic base is a basic salt or oxide of a water-

soluble alkali metal or an alkaline earth metal; wherein the amount of such base is the stoichiometric quantity, or is substantially the stoichiometric quantity, theoretically required to deprotonate the nitrogen atoms of said 5,5-dimethylhydantoin; [at least one nitrogen atom of said hydantoin;] wherein said brominating agent [and/or chlorinating agent] is (i) bromine, (ii) [chlorine, (iii) bromine chloride, (iv)] an alkali metal bromide or aqueous solution thereof, or an alkaline earth metal bromide or aqueous solution thereof, and chlorine, or hypochlorite salt or aqueous hypochlorite solution in amounts sufficient to generate bromine *in situ*, or (iii) [(v)] a combination of [any two or more of] (i) and (ii); [, (ii), (iii), and (iv);] wherein at least all or such portion of said brominating agent [and/or chlorinating agent] that is in the vapor state, if any, is fed subsurface to the liquid phase of the aqueous reaction mixture; wherein the temperature of the aqueous reaction mixture is continuously or substantially continuously in the range of from about 30 to about 90°C during all or substantially all of the time said feeding is occurring; and wherein the proportions of the feeds are such that the total amount of said brominating agent [and/or chlorinating agent] being fed to N-halogenate the 5,5-dimethylhydantoin [5,5-dialkylhydantoin] being fed are such that there are in the range of about 3.8 to about 4.2 atoms of bromine [halogen] per molecule of 5,5-dimethylhydantoin [5,5-dialkylhydantoin].

11. (Twice Amended) A process of any of Claims 132, 2, or 9 wherein said process is conducted in a continuous mode in which, under steady state conditions, said feed(s) are maintained such that the ratio of (i) the volume of said

reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute.

12. (Twice Amended) A process of any of Claims 132, 2, or 9 wherein said process is conducted in batch mode in at least one reactor and wherein, until the volume of the reaction mixture reaches 50 percent of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute; and wherein, when the volume of the reaction mixture is 50 percent or more of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] being fed to the reaction mixture per minute is in the range of about 30 to about 60 liters per mole per minute.

15. (Amended) A process of Claim 14 [wherein said compound having in the molecule at least one halogenatable amido or imido nitrogen atom is a cyclic amide or cyclic imide; and] wherein said brominating agent [and/or chlorinating

agent] is bromine, [chlorine, bromine chloride, or a combination of any two or all three of them,] and is fed subsurface to the liquid phase of said reaction mixture.

16. (Amended) A process of Claim 14 [wherein said compound having in the molecule at least one halogenatable amido or imido nitrogen atom is a cyclic amide or cyclic imide; and] wherein said brominating agent [and/or chlorinating agent] is (i) an alkali metal bromide or an alkaline earth metal bromide, and (ii) chlorine, a hypochlorite salt, or an aqueous hypochlorite solution in amounts sufficient to generate bromine *in situ*, and if (ii) is chlorine, at least the chlorine is fed subsurface to the liquid phase of said reaction mixture.

17. (Amended) A process of Claim 14 wherein the inorganic base is a water-soluble basic salt or oxide of an alkali metal or an alkaline earth metal, and wherein the amount of such base is the stoichiometric quantity, or is substantially the stoichiometric quantity, theoretically required to deprotonate the nitrogen atoms of said 5,5-dimethylhydantoin. [at least one imido group of said compound or to fully or partially deprotonate at least one amido group of said compound.]

18. (Twice Amended) A process of Claim 132 wherein said aqueous reaction mixture is at one or more temperatures in the range of about 0 to about 90°C, and wherein if said brominating agent [and/or chlorinating agent] is in the form of a vapor, said vapor is fed subsurface to the liquid phase of the reaction mixture.

19. (Twice Amended) A process of any of Claims [132,] 14, 15, or 16 wherein said process is conducted in a continuous mode in which, under steady state conditions, said feed(s) are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute.

20. (Twice Amended) A process of any of Claims [132,] 14, 15, or 16 wherein said process is conducted in a batch mode in at least one reactor and wherein, until the volume of the reaction mixture reaches 50 percent of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said N-halogenatable compound] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute; and wherein, when the volume of the reaction mixture is 50 percent or more of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [N-halogenatable compound] being fed to the reaction mixture per minute is in the range of about 30 to about 60 liters per mole per minute.

22. (Amended) A process of Claim 21 [wherein said compound having

in the molecule at least one halogenatable amido or imido nitrogen atom is a 5-alkyl hydantoin or a 5,5-dialkylhydantoin;] wherein the temperature of said reaction mixture is in the range of about 20 to about 80°C, and wherein, if all or part of said brominating agent [and/or chlorinating agent] is in the form of a vapor, said vapor is fed subsurface to the liquid phase of said reaction mixture.

23. (Twice Amended) A process of Claim 132 wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin [said compound] being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.5 to about 2.5 moles of the base, per liter of water; and

B) where the base has a divalent cation, there are about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.25 to about 1.25 moles of the base, per liter of water.

24. (Twice Amended) A process of Claim 132 wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin [said compound] being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 1.0 to about 1.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 1.0 to about 1.5 moles of the base, per liter

of water; and

B) where the base has a divalent cation, there are about 1.0 to about 1.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.5 to about 0.75 moles of the base, per liter of water.

27. (Twice Amended) A process of Claim 132 wherein the process is conducted in a continuous mode; wherein the temperature of the aqueous reaction mixture is in the range of about 20 to about 90°C; and wherein said inorganic base and 5,5-dimethylhydantoin [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] are fed either as separate solutions or slurries in water or as a single solution or slurry in water.

28. (Twice Amended) A process of Claim 27 wherein during steady-state operation, precipitate is continuously being formed that (1) has a purity of at least about 97%, and (2) is formed in a continuous or substantially continuous yield of at least about 85% based on the amount of the 5,5-dimethylhydantoin [compound having at least one halogenatable amido or imido nitrogen atom] being fed to the reactor.

Cancel Claims 29 and 30 without prejudice or disclaimer.

31. (Amended) A process of Claim 133 [30] wherein said process is conducted in a continuous mode in which, under steady state conditions, said

feed(s) are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of said hydantoin being fed to the reaction mixture per minute is in the range of about 30 to about 60 [10 to about 100] liters per mole per minute.

Cancel Claim 32 without prejudice or disclaimer.

33. (Twice Amended) A process of Claim 133 [30] wherein said process is conducted in batch mode in at least one reactor and wherein, until the volume of the reaction mixture reaches 50 percent of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said compound having in the molecule at least one N-halogenatable amido or imido nitrogen atom] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute; and wherein, when the volume of the reaction mixture is 50 percent or more of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said hydantoin] being fed to the reaction mixture per minute is in the range of about 30 to about 60 liters per mole per minute.

35. (Twice Amended) A process of Claim 132 [wherein said compound having in the molecule at least one halogenatable amido or imido nitrogen atom is

a 5,5-dialkylhydantoin in which each alkyl group has, independently, up to about six carbon atoms;] wherein said inorganic base is a basic salt or oxide of an alkali metal or an alkaline earth metal; wherein the amount of such base is the stoichiometric quantity, or is substantially the stoichiometric quantity, theoretically required to deprotonate the nitrogen atoms of the 5,5-dimethylhydantoin; [at least one nitrogen atom of said hydantoin;] wherein said brominating agent [and/or chlorinating agent] is (i) bromine, (ii) [chlorine, (iii) bromine chloride, (iv)] an alkali metal bromide or aqueous solution thereof, or an alkaline earth metal bromide or aqueous solution thereof, and chlorine, or hypochlorite salt or aqueous hypochlorite solution in amounts sufficient to generate bromine *in situ*, or (iii) a combination of (i) and (ii); [(v) a combination of any two or more of (i), (ii), (iii), and (iv);] wherein at least all or such portion of brominating agent [and/or chlorinating agent] that is in the vapor state, if any, is fed subsurface to the liquid phase of the aqueous reaction mixture; wherein the temperature of the aqueous reaction mixture is continuously or substantially continuously maintained in the range of from about 20 to about 80°C during all or substantially all of the time said feeding is occurring; and wherein said process is conducted in a continuous mode in which, under steady state conditions, the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said 5,5-dialkylhydantoin] being fed to the reaction mixture per minute is in the range of about 30 to about 60 liters per mole per minute.

36. (Twice Amended) A process of Claim 132 [wherein said compound having in the molecule at least one halogenatable amido or imido nitrogen atom is a 5,5-dialkylhydantoin in which each alkyl group has, independently, up to about six carbon atoms;] wherein said inorganic base is a basic salt or oxide of an alkali metal or an alkaline earth metal; wherein the amount of such base is the stoichiometric quantity, or is substantially the stoichiometric quantity, theoretically required to deprotonate the nitrogen atoms of the 5,5-dimethylhydantoin; [at least one nitrogen atom of said hydantoin;] wherein said brominating agent [and/or chlorinating agent] is (i) bromine, (ii) [chlorine, (iii) bromine chloride, (iv)] an alkali metal bromide or an alkaline earth metal bromide, and chlorine, a hypochlorite salt, or an aqueous hypochlorite solution in amounts sufficient to generate bromine *in situ*, or (iii) a combination of (i) and (ii); [(v) a combination of any two or more of (i), (ii), (iii), and (iv);] wherein at least all or such portion of said brominating agent [and/or chlorinating agent] that is in the vapor state, if any, is fed subsurface to the liquid phase of the aqueous reaction mixture; wherein the temperature of said aqueous reaction mixture is continuously or substantially continuously maintained in the range of from about 20 to about 80°C during all or substantially all of the time said feeding is occurring; wherein said process is conducted in a batch mode in at least one reactor; wherein, until the volume of the reaction mixture reaches 50 percent of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said 5,5-dialkylhydantoin] being fed to the reaction mixture per minute is in the range of

about 20 to about 80 liters per mole per minute; and wherein, when the volume of the reaction mixture is 50 percent or more of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said 5,5-dialkylhydantoin] being fed to the reaction mixture per minute is in the range of about 30 to about 60 liters per mole per minute.

Cancel Claims 39 and 40 without prejudice or disclaimer.

41. (Amended) A process of Claim 35 [39] wherein said pH is in the range of about 6.8 to about 7.2; wherein said temperature in the range of about 30 to about 70°C; and wherein said brominating agent [and/or chlorinating agent] is bromine.

42. (Amended) A process of Claim 133 [30] wherein said pH is continuously or substantially continuously maintained in the range of about 6.8 to about 7.2 during all or substantially all of the time said feeding is occurring; wherein said temperature of the aqueous reaction mixture is maintained in the range of about 30 to about 70°C during all or substantially all of the time said feeding is occurring; and wherein the brominating agent [and/or chlorinating agent] is bromine.

43. (Twice Amended) A process for the N-halogenation of 5,5-dimethylhydantoin, [a compound having at least one halogenatable amido or imido functional group in the molecule,] which process comprises concurrently feeding into a reaction zone, separate feeds of (i) an aqueous solution or slurry formed from an inorganic base and 5,5-dimethylhydantoin, [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom,] and (ii) a brominating agent [and/or chlorinating agent] in proportions such that 1,3-dibromo-5,5-dimethylhydantoin is formed and [at least one said amido or imido nitrogen atom becomes substituted by a bromine or chlorine atom and the resultant product] precipitates in a liquid phase of a reaction mixture during all or substantially all of the time said concurrent feeding is occurring, and such that the pH of said mixture is continuously or substantially continuously maintained in the range of about 6.5 to about 8.5 during all or substantially all of the time said concurrent feeding is occurring.

44. (Amended) A process of Claim 43 wherein (ii) is bromine, [chlorine, bromine chloride, or a combination of any two or all three of them,] and is fed subsurface to the liquid phase of the reaction mixture.

46. (Amended) A process of Claim 43 wherein the inorganic base is a water-soluble basic salt or oxide of an alkali metal or an alkaline earth metal, and wherein the amount of such base is the stoichiometric quantity, or is substantially the stoichiometric quantity, theoretically required to deprotonate the nitrogen

atoms of the 5,5-dimethylhydantoin. [at least one imido group of said compound or to fully or partially deprotonate at least one amido group of said compound.]

51. (Amended) A process of Claim 43 wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin [said compound] being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.5 to about 2.5 moles of the base, per liter of water; and

B) where the base has a divalent cation, there are about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.25 to about 1.25 moles of the base, per liter of water.

52. (Amended) A process of Claim 43 wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin [said compound] being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 1.0 to about 1.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 1.0 to about 1.5 moles of the base, per liter of water; and

B) where the base has a divalent cation, there are about 1.0 to about 1.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.5 to about 0.75 moles of the base, per liter of water.

53. (Amended) A process of Claim 43 wherein the process is conducted in a batch mode in at least one reactor and wherein, until the volume of the reaction mixture reaches 50 percent of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [said N-halogenatable compound of (a)] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute; and wherein, when the volume of the reaction mixture is 50 percent or more of the total volume of the reactor(s), the feeds to said reaction mixture are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [N-halogenatable compound] being fed to the reaction mixture per minute is in the range of about 30 to about 60 liters per mole per minute.

54. (Amended) A process of Claim 43 wherein the process is conducted in a continuous mode in which, under steady state conditions, said feed(s) are maintained such that the ratio of (i) the volume of said reaction mixture in liters to (ii) the moles of 5,5-dimethylhydantoin [N-halogenatable compound] being fed to the reaction mixture per minute is in the range of about 10 to about 100 liters per mole per minute.

Cancel Claims 55 and 56 without prejudice or disclaimer.

58. (Amended) A process for the production of 1,3-dibromo-5,5-dimethylhydantoin, [a 1,3-dihalo-5,5-dimethylhydantoin,] which process comprises concurrently feeding into a reaction zone (i) water, inorganic base, and 5,5-dimethylhydantoin, these being fed separately and/or in any combination(s), and (ii) a separate feed of a brominating agent [and/or a chlorinating agent,] in proportions such that during all or substantially all of the time the concurrent feeding is occurring 1,3-dibromo-5,5-dimethylhydantoin [1,3-dihalo-5,5-dimethylhydantoin] is formed and precipitates in the liquid phase of an aqueous reaction mixture, and in which the pH of said liquid phase is continuously or substantially continuously maintained in the range of about 6.5 to about 8.5 during all or substantially all of the time the concurrent feeding is occurring.

Cancel Claim 61 without prejudice or disclaimer.

73. (Amended) A process of Claim 58 wherein the process is conducted in a batch mode by initiating the concurrent feeds of (i) and (ii) to a reactor containing (a) a solids-containing heel of a reaction mixture from a prior reaction in which the 1,3-dibromo-5,5-dimethylhydantoin [1,3-dihalo-5,5-dimethylhydantoin] to be formed had been formed, or (b) a solids-free mother liquor of a reaction mixture from a prior reaction in which the 1,3-dibromo-5,5-dimethylhydantoin [1,3-dihalo-5,5-dimethylhydantoin] to be formed had been

formed, and discontinuing the concurrent feeds of (i) and (ii) when the reactor has been filled to the desired level.

74. (Amended) A process of Claim 70 wherein the process is conducted in a batch mode by initiating the concurrent feeds of (i) and (ii) to the reactor containing (a) a solids-containing heel of a reaction mixture from a prior reaction in which the 1,3-dibromo-5,5-dimethylhydantoin [1,3-dihalo-5,5-dimethylhydantoin] to be formed had been formed, or (b) a solids-free mother liquor of a reaction mixture from a prior reaction in which the 1,3-dibromo-5,5-dimethylhydantoin [1,3-dihalo-5,5-dimethylhydantoin] to be formed had been formed, and discontinuing the concurrent feeds of (i) and (ii) when the reactor has been filled to the desired level.

75. (Amended) A process of any of Claims 132, [1,] 133, [13,] 14, or 43 wherein the proportions of said brominating agent [and/or chlorinating agent] and 5,5-dimethylhydantoin [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] being fed are such that there are in the range of about 1.9 to about 2.1 atoms of bromine per [halogen per halogenatable amido or imido] nitrogen atom to be brominated. [halogenated.]

76. (Amended) A process of any of Claims 58, 59, 60, [61,] 62, or 69 wherein the proportions of the brominating agent [and/or chlorinating agent] and 5,5-

dimethylhydantoin being fed are such that there are in the range of about 3.8 to about 4.2 atoms of bromine [halogen] per molecule of 5,5-dimethylhydantoin.

77. (Amended) A process of Claim [56 or] 58 wherein (ii) is bromine and wherein the rate at which (i) and (ii) are being fed is such that the color of the reaction mixture is yellow to reddish yellow.

78. (Twice Amended) A process for the N-halogenation of 5,5-dimethylhydantoin [a compound having at least one halogenatable amido or imido functional group in the molecule,] which process comprises:

I) concurrently and continuously feeding into a reactor containing an aqueous reaction mixture:

A) separate feeds of (i) an aqueous solution or slurry formed from an inorganic base and 5,5-dimethylhydantoin [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom,] and (ii) a brominating agent [and/or a chlorinating agent]; or

B) at least three separate feeds, one of which is a brominating agent [and/or a chlorinating agent], and at least two other feeds, at least one of which is selected from (a) and (b); and at least one of which is selected from (c) and (d), wherein

(a) is an aqueous solution or slurry formed from an inorganic base,

(b) is an aqueous solution or slurry formed from an inorganic base and 5,5-dimethylhydantoin, [a compound having in the

molecule at least one halogenatable amido or imido nitrogen atom,]

(c) is 5,5-dimethylhydantoin, [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom,] and

(d) is an aqueous solution or slurry formed from 5,5-dimethylhydantoin; [a compound having in the molecule at least one halogenatable amido or imido nitrogen atom;]

in proportions such that 1,3-dibromo-5,5-dimethylhydantoin is formed and [at least one said amido or imido nitrogen atom becomes substituted by a bromine or chlorine atom and a precipitate of the resultant product] precipitates in the liquid phase of an aqueous reaction mixture during all or substantially all of the time said concurrent feeding is occurring, and such that the pH of said reaction mixture is continuously or substantially continuously maintained in the range of about 5.5 to about 8.5 during all or substantially all of the time said concurrent feeding is occurring; and

II) periodically or continuously removing precipitate and a portion of the reaction mixture from the reactor.

82. (Amended) A process of Claim 78 wherein the temperature of said aqueous reaction mixture is in the range of about 20 to about 90°C, and wherein if said brominating agent [and/or chlorinating agent] is in the form of a vapor, said vapor is fed subsurface to the liquid phase of said reaction mixture in I).

83. (Amended) A process of Claim 80 wherein the temperature of said aqueous reaction mixture is in the range of about 30 to about 70°C, and wherein if said brominating agent [and/or chlorinating agent] is in the form of a vapor, said vapor is fed subsurface to the liquid phase of said reaction mixture in I).

84. (Amended) A process of Claim 78 wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin [said compound] being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.5 to about 2.5 moles of the base, per liter of water; and

B) where the base has a divalent cation, there are about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.25 to about 1.25 moles of the base, per liter of water.

85. (Amended) A process of Claim 78 wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin [said compound] being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 1.0 to about 1.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 1.0 to about 1.5 moles of the base, per liter of water; and

B) where the base has a divalent cation, there are about 1.0 to about 1.5 moles of 5,5-dimethylhydantoin [halogenatable amido or imido nitrogen atoms] and from about 0.5 to about 0.75 moles of the base, per liter of water.

86. (Amended) A process of Claim 78 wherein said brominating agent [and/or chlorinating agent] is bromine, [chlorine, bromine chloride, or a combination of any two or all three of them,] and is fed subsurface to the liquid phase of the reaction mixture in I).

87. (Amended) A process of Claim 78 wherein said brominating agent [and/or chlorinating agent] is an alkali metal bromide or an alkaline earth metal bromide and chlorine, a hypochlorite salt, or an aqueous hypochlorite solution in amounts sufficient to generate bromine *in situ*, and if chlorine is used, said chlorine is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

88. (Amended) A process of any of Claims 84 or 85 [Claim 78] wherein said brominating agent [and/or chlorinating agent] is bromine, and wherein the bromine is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

89. (Amended) A process of Claim 78 [88] wherein the bromine is fed as a mixture of bromine vapor and at least one inert gas.

90. (Amended) A process of Claim 78 wherein said inorganic base and 5,5-dimethylhydantoin [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] are fed either as separate solutions or slurries in water or as a single solution or slurry in water.

93. (Amended) A process of Claim 84 wherein said pH is in the range of about 6.8 to about 7.2; wherein the temperature of said aqueous reaction mixture is in the range of about 30 to about 90°C; wherein if said brominating agent [and/or chlorinating agent] is in the form of a vapor, said vapor is fed subsurface to the liquid phase of the reaction mixture in I); and wherein said inorganic base and 5,5-dimethylhydantoin [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] are fed either as separate solutions or slurries in water or as a single solution or slurry in water.

94. (Amended) A process of Claim 93 wherein the inorganic base used in forming said solution or slurry is a water-soluble basic salt or oxide of an alkali metal or an alkaline earth metal; wherein said brominating agent [and/or chlorinating agent] is bromine; and wherein the bromine is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

96. (Amended) A process of Claim 85 wherein said pH is in the range of about 6.8 to about 7.2; wherein the temperature of said aqueous reaction mixture is in the range of about 30 to about 70°C; wherein if all or a portion of said

brominating agent [and/or chlorinating agent] is in the form of a vapor, at least said vapor is fed subsurface to the liquid phase of said reaction mixture in I); and wherein said inorganic base and 5,5-dimethylhydantoin [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] are fed either as separate solutions or slurries in water or as a single solution or slurry in water.

97. (Amended) A process of Claim 96 wherein the inorganic base used is a water-soluble basic salt or oxide of an alkali metal or an alkaline earth metal; wherein said brominating agent [and/or chlorinating agent] is bromine; and wherein the bromine is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

Cancel Claims 99 and 100 without prejudice or disclaimer.

101. (Amended) A process of Claim 78 [99 wherein said hydantoin is 5,5-dimethylhydantoin, and] wherein said pH is in the range of about 6.8 to about 7.2.

102. (Amended) A process of Claim 101 wherein the temperature of said aqueous reaction mixture is in the range of about 20 to about 80°C, and wherein if all or a portion of said brominating agent [and/or chlorinating agent] is in the form of a vapor, at least said vapor is fed subsurface to the liquid phase of said reaction mixture in I).

106. (Amended) A process of Claim 101 wherein said brominating agent [and/or chlorinating agent] is bromine, [chlorine, bromine chloride, or a combination of any two or all three of them,] and is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

107. (Amended) A process of Claim 101 wherein said brominating agent [and/or chlorinating agent] is an alkali metal bromide or an alkaline earth metal bromide and chlorine, hypochlorite salt, or an aqueous hypochlorite solution in amounts sufficient to generate bromine *in situ*, and wherein if chlorine is used, said chlorine is fed subsurface to the aqueous reaction mixture in I).

108. (Amended) A process of Claim 101 wherein said brominating agent [and/or chlorinating agent] is bromine, and wherein the bromine is fed subsurface to the aqueous reaction mixture in I).

113. (Amended) A process of Claim 110 wherein the temperature of said aqueous reaction mixture is in the range of about 40 to about 60°C; wherein if all or a portion of said brominating agent [and/or chlorinating agent] is in the form of a vapor, at least said vapor is fed subsurface to the liquid phase of the aqueous reaction mixture in I); and wherein the proportions of water, inorganic base, and 5,5-dimethylhydantoin being fed are such that:

A) where the inorganic base has a monovalent cation, there are from about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin and from about 1.0 to about 5.0

moles of the base, per liter of water; and

B) where the base has a divalent cation, there are about 0.5 to about 2.5 moles of 5,5-dimethylhydantoin and from about 0.5 to about 2.5 moles of the base, per liter of water.

114. (Amended) A process of Claim 113 wherein said brominating agent [and/or chlorinating agent] is bromine; and wherein the bromine is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

117. (Amended) A process of Claim 116 wherein said brominating agent [and/or chlorinating agent] is bromine; and wherein the bromine is fed subsurface to the liquid phase of the aqueous reaction mixture in I).

Cancel Claim 119 without prejudice or disclaimer.

120. (Amended) A process of Claim 133 [13] or 78 wherein the process is conducted adiabatically and with agitation of the aqueous reaction mixture.

121. (Amended) A process of Claim [100 or] 101 wherein the halogen is bromine and wherein the rate at which the feeds are being fed is such that the color of the reaction mixture is yellow to reddish yellow.

122. (Amended) A process of any of Claims 78, 93, or 96[, or 119] wherein the proportions of said brominating agent and 5,5-dimethylhydantoin [and/or chlorinating agent and said compound having in the molecule at least one halogenatable amido or imido nitrogen atom] being fed are such that there are in the range of about 3.8 [1.9] to about 4.2 [2.1] atoms of bromine [halogen] per atom of nitrogen. [halogenatable amido or imido group to be halogenated.]

124. (Twice Amended) A process for the N-halogenation of 5,5-dimethylhydantoin, [a compound having in the molecule at least one halogenatable amido or imido functional group in the molecule,] which process comprises:

a) concurrently feeding into a reactor (i) water, inorganic base, and 5,5-dimethylhydantoin, [said compound having in the molecule at least one halogenatable amido or imido nitrogen atom,] these components being fed separately and/or in any combination(s), and (ii) a separate feed of a brominating agent, in proportions such that:

   1) both nitrogen atoms of the 5,5-dimethylhydantoin become [at least one said amido or imido nitrogen atom becomes] substituted by a bromine atom;

   2) during all or substantially all of the time the concurrent feeding is occurring, the product precipitates in the liquid phase of an aqueous reaction mixture in which the pH is continuously or substantially continuously maintained in the range of about 5.5 to about 8.5; and

   3) an aqueous solution of co-product inorganic bromide salt is formed;

b) separating precipitate from said aqueous solution; and

c) oxidizing co-product inorganic bromide salt in said solution to form elemental bromine.

127. (Amended) A process of any of Claims 124-126 [wherein said compound having at least one halogenatable amido or imido nitrogen atom is a 5,5-dialkylhydantoin;] wherein said inorganic base is a water-soluble basic salt or oxide of an alkali metal or an alkaline earth metal; and wherein said brominating agent is bromine fed subsurface to the liquid phase of the aqueous reaction mixture.

128. (Amended) A process of Claim 124 [wherein said compound having in the molecule at least one halogenatable amido or imido nitrogen atom is 5,5-dimethylhydantoin;] wherein said pH is maintained in the range of about 6.8 to about 7.2; and wherein the temperature of said reaction mixture is maintained in the range of about 40 to about 60°C.

130. (Amended) A process of any of Claims 133, [13,] 43, or 58 wherein [said brominating agent and/or chlorinating agent is a brominating agent whereby] an aqueous solution of co-product inorganic bromide salt is formed; wherein precipitate is separated from said aqueous solution; and wherein co-product inorganic bromide salt in said solution is oxidized to form elemental bromine.

131. (Amended) A process of Claim 78 wherein [said brominating agent and/or chlorinating agent is a brominating agent whereby] co-product inorganic bromide salt is formed in the aqueous reaction mixture; wherein the inorganic bromide salt in the aqueous solution remaining after said precipitate has been removed therefrom is oxidized to form elemental bromine.

Cancel Claims 134 and 135 without prejudice or disclaimer.